

Please amend the application as follows:

IN THE CLAIMS

Please consider amended claim 1 as follows:

SA
C1
B4

--1. (Twice Amended) A method for modifying the rheology of a slurry of a mineral-containing solid material and water, wherein the mineral-containing solid material is nickel ore, cobalt ore, precious metals ore, copper ore, taconite, mineral sands, coal, bauxite or a mixture thereof, the method comprising adding to the slurry a sulfonate-containing polymer wherein the polymer is prepared by polymerization of vinyl monomers containing a sulfonate functional group with an amu ranging from about 2,000 to 100,000.

REMARKS

Claims 1, 2 and 4-7 are currently pending before Examiner Reddick.

Support for the amendments are found in the specification at page 5, lines 14 and 15. No new matter is believed to have been added with the amended claim.

Applicants are providing a definition of the term "amu" as referenced in the chemistry text Chemistry, The Universal Science, p.22. Pilar, Frank L., Addison-Wesley Publishing Company, 1979. The cited page is enclosed along with other relevant pages for the Examiner's consideration. Additionally, Applicants provide a copy of a description of "aminoplast" polymers or resins as defined in Principles of Polymerization, Chapter 2, pp. 133-135., Odian, George G., John Wiley & Son Inc. Again, the appropriate pages are provided for the Examiner's

ease of reference. Relevant portions of each of these references are highlighted for the Examiner's convenience.

The presently claimed inventive method as disclosed relates to mining and mining processing applications wherein the rheological (that is the effects of deformation and flow of materials in terms of stress, strain and time) properties of slurries are modified in order to achieve reduced viscosity and improved slurry consistency. The method as claimed utilizes a sulfonate-containing polymer prepared by the polymerization of vinyl monomers containing sulfonate groups, a rheological modifier, having amu (atomic mass unit) ranging from 2,000 to 100,000. Surprisingly the rheological modifiers provide beneficial results in mining applications as acceptable viscosity reduction is achieved at lower dosages than conventionally available modifiers. These modifiers can be added to the water of a slurry before or after establishment of the slurry.

Claims 1, 2 and 4-7 stand rejected under 35 U.S.C. 112, 2nd paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

This rejection is submitted to be overcome by amendment to claim 1 by stating that the molecular weight of the sulfonate containing vinyl (addition) polymer is measured in units called out for in "amu" or atomic mass units. Applicants attached reference from Chemistry, the Universal Science, p. 22 shows that "amu" refers to "atomic mass units" and is appropriate for defining the atomic mass of either atoms or molecules. Therefore, it is submitted that this

quantitative recitation is readily understandable to one of ordinary skill in the art and the claim is not indefinite.

Claims 1, 2 and 4-7 stand rejected under 35 U.S.C. 102(b) as anticipated by, or in the alternative, under 35 U.S.C. 103(a) as obvious over Halverson and/or Richardson et al. for the reasons of record.

Halverson, U.S. Patent No. 4,342,653 discloses and claims a method of flocculating the residues of various waste (e.g. mining) processes. Halverson further discloses flocculating or settling a suspension of solids also containing (dissolved) multivalent cations.

U.S. Patent No. 4,704,209 to Richardson et.al. teaches a process to flocculate waste streams and slimes of a variety of materials utilizing a flocculent polymer containing acrylamido methyl propanesulfonic acid monomers.

Horsley et al., U.S. Patent No. 4,688,588. is directed to a method for facilitating the flow of (mineral) fines where the fines contain impurities described as metal oxide, carbonate and sulfides and ash. Horsley's invention is directed to utilizing inorganic dispersants and naphthalene sulfonate aminoplast polymers. These polymers are named but never described or illustrated in terms of structure, synthesis or molecular weight.

Brown et al., U.S. Patent 5, 317, 053, is directed to a method for producing a high solids aqueous slurry of particulate calcium carbonate having highly stable aging characteristics. Brown et al. uses a co-polymer of acrylic acid and a sulfonated vinyl monomer which is converted to the salt form with about 30 to 50 percent of its carboxylic acids being neutralized

with a polyvalent cation and subsequently the balance of the carboxylic acids sites being neutralized with a multivalent cation. This patent teaches a method for preparing a time stable slurry.

As described above, Halverson (U.S, 4,342,653) is directed to a method of flocculating the residues of various waste (e.g. mining) processes. Halverson further teaches flocculating or settling a suspension of solids also containing (dissolved) multivalent cations. In contrast, the presently claimed invention is directed to a method for modifying the rheology of a slurry of the disclosed polymers. As such, the method claimed in Halverson is not the same as in the present invention. Flocculating a slurry of a waste stream is not modifying the rheology of a mineral and water slurry. Flocculating involves allowing a slurry to remain in an undisturbed state to facilitate the separation of solid materials and this does not teach or suggest modifying the rheology, that is flow characteristics, of a mineral-containing slurry. As the method of Halverson does not teach or suggest the presently claimed invention the rejection is respectfully requested to be withdrawn.

Richardson, et. al U.S. Patent No. 4,704,209 is directed to flocculating suspended solids utilizing copolymers of acrylamide and 2-acrylamido-2-methylpropanesulfonic acid and not modifying the rheology of a slurry as is the presently claimed invention. As in the case of Halverson, how would one of ordinary skill know that the method of Richardson, et. al. would be useful in producing a slurry having improved rheological characteristics? As the presently claimed method is neither disclosed or suggested in Richardson, Applicants respectfully request the rejection be withdrawn.

Claims 1 and 5 stand rejected under 35 U.S.C. 102(b) as anticipated by, or in the alternative, under 35 U.S.C. 103(a) as obvious over Horsley et al.

Claims 2, 4, 6 and 7 stand rejected under 35 U.S.C.103(a) as being unpatentable over Horsley et al in combination with Brown et al.

Horsley is directed to a method for facilitating the flow of (mineral) fines where the fines contain impurities described as metal oxide, carbonate and sulfides and ash utilizing inorganic dispersants and naphthalene sulfonate aminoplast polymers. However, these polymers are named but never described or illustrated in terms of structure, synthesis or molecular weight. Applicants have attached a common description of “aminoplast” type plastics to illustrate the differences between such materials and the presently claimed invention from Principles of Polymerization, Chapter 2, pp. 133-135., Odian, George G., John Wiley & Son Inc. Aminoplasts are condensation polymers, typically thremosetting resins, made by the reaction of an amine with an aldehyde; commercial formaldehyde condensed with urea and/ or melamine being the typical monomers used. These materials are prepared by condensing two monomers and eliminates water during the synthesis, hence the name “condensation”. The structure and properties of these materials are well known to be different than the structure and properties of the polymers in the present invention. Given these known differences between the vinyl addition polymers of the present invention and the aminoplast polymers of Horsley applicants respectfully suggest that Horsley neither teaches nor suggests utilizing vinyl addition polymers to modify the rheology of a slurry and as such the rejection should be withdrawn.

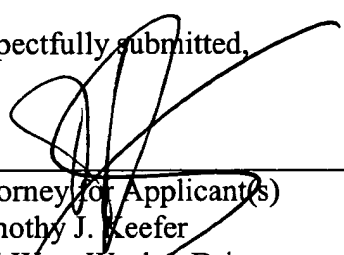
Claims 2, 4, 6 and 7 stand rejected under 35 U.S.C.103 (a) as being unpatentable over Horsley et al in combination with Brown et. al.

As Horsley teaches naphthalene sulfonate aminoplast polymers for rheological modification of a slurry containing impurities and Brown et. al. teaches producing time-stable slurries and not rheological modifications Applicants suggest that their combination is improper for the reasons stated above. There is provided no motivation for one of ordinary skill in the art to substitute a material as taught in Brown which flocculates solids for a structurally different material as taught in Horsley to arrive at the presently claimed invention. Applicants suggest that such a modification is neither taught or suggested in view of the presently claimed invention. The rejection should therefore be withdrawn.

Given the above amendment to the claims, Applicants have defined their polymers with a reasonable degree of specificity sufficient to allow one of ordinary skill to practice the invention. Moreover, Applicants have shown that none of the references which use similar polymers teach or suggest a method of modifying the rheology of a mineral-containing solid, nor does an alternative reference teaching the use of a sulfonated naphthalene aminoplast polymer rheological modifier suggest using vinyl addition polymers in a method to modify the rheological properties of a slurry as does the present invention. In view of the aforesaid it is respectfully submitted that no reference taken alone serves to anticipate or make obvious of the inventive method as claimed nor is there any foreseeable permissible means to combine any references such that one could arrive at the method as now claimed. Accordingly, Applicants respectfully request reconsideration and believe with the admission of the above amendments

that the application stands ready for allowance. Early Notice of Allowance is respectfully requested.

Respectfully submitted,



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Mindy Fitch



VERSION WITH MARKINGS TO SHOW CHANGES MADE

--1. (Twice Amended) A method for modifying the rheology of a slurry of a mineral-containing solid material and water, wherein the mineral-containing solid material is nickel ore, cobalt ore, precious metals ore, copper ore, taconite, mineral sands, coal, bauxite or a mixture thereof, the method comprising adding to the slurry a sulfonate-containing polymer wherein the polymer is prepared by polymerization of vinyl monomers containing a sulfonate functional group with an [having an average molecular weight] amu ranging from about 2,000 to 100,000.